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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/647,250	08/26/2003	Akira Ueda	1614.1360	2448

21171 7590 07/14/2006

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EXAMINER	
BROOME, SAID A	

ART UNIT	PAPER NUMBER
2628	

DATE MAILED: 07/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/647,250	UEDA ET AL.
	Examiner	Art Unit
	Said Broome	2628

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 May 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 3-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 3-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 1 and 3-15 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Regarding claims 1 and 11-15, the claims describe forming grid lines orthogonally crossing each other over a target object, forming cube data from mesh data and determining whether each mesh element forming the mesh data forms the target object based on a first condition, and reducing cube elements in number by combining cube elements in accordance with a second condition however, no useful, concrete and tangible result is produced because the data is not used to provide a displayed object or any other indication of resulting generated mesh data. Therefore, the claimed invention does not posses "real world" value, and instead represents nothing more than a process of determining forming orthogonal grid lines over an object, forming cube data from mesh data and determining whether each mesh element forming the mesh data forms the target object based on a first condition and reducing the number of cube elements based on a second condition.

Claim Objections

Claims 4-8 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel

the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1 and 3-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marusich (US 2002/0198693).

Regarding claim 1, Marusich teaches forming grid lines orthogonally crossing each other over a target in paragraph 0005 lines 1-7 ("The configuration of the elements used to divide the component or workpiece determines many of the properties and accuracy of the model...In three dimensions, tetrahedrons or cubes are often used."), where it is described that the mesh may be divided into cubes, which would provide orthogonally crossed lines over the surface of the object. Marusich also teaches forming cube data from mesh data obtained by dividing the target object by the grid lines, the cube data being formed of cube elements that are mesh elements forming the target object, wherein the cube data is obtained by determining whether each of mesh elements forming the mesh data forms the target object, as described in paragraph 0005 lines 1-7 ("The configuration of the elements used to divide the component or workpiece determines many of the properties and accuracy of the model...In three dimensions, tetrahedrons or cubes are often used.") based on a first condition of the target object in the mesh element, as

described in paragraph 0039 lines 8-19 ("...elements can be refined, or re-meshed with additional, smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger elements to provide less detail and to reduce the computations needed in areas of less interest...Adaptive meshing further includes adding or removing elements in contrast to refining or coarsening the mesh."), where it is described that the mesh surface is divided based on a first condition, or the ratio of the mesh elements to the overall object. Marusich also teaches reducing the cube elements in number by combining the cube elements in paragraph 0039 lines 8-19 ("...elements can be refined, or re-meshed with additional, smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger elements to provide less detail and to reduce the computations needed in areas of less interest...Adaptive meshing further includes adding or removing elements in contrast to refining or coarsening the mesh."), in accordance with a second condition selected from a group of second conditions consisting of preventing a change of a shape of the target object formed of the cube data, preserving a substantial shape of the target object formed of the cube data, preventing a substantial change of a total volume of the combine cube elements, preserving the total volume of the combined cube elements, as described in paragraph 0039 lines 25-27 ("An adaptive meshing change in orientation of a shared surface does not affect overall volume or the number of elements in the mesh."), in which the executed condition is chosen to ensure the preservation of the shape of the object, and maintaining an aspect ratio of surfaces of each of composite cube elements created by combining the cube elements within a predetermined range,

as described in paragraph 0050 lines 8-11 ("The modeling element includes a good aspect ratio in the parent element and sub-elements to improve accuracy and computational efficiency."). It would have been obvious to one of ordinary skill in the art to modify the teachings of Marusich because the adaptive meshing that reduces the number of elements may be applied with any shape, including rectangles or cubes, comprising a mesh surface as known in the art.

Regarding claim 3, Marusich teaches the first condition of the target object n the mesh element is a ratio of volume of the target object in the mesh element to volume of the mesh element, as described in paragraph 0039 lines 25-28 ("...smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger elements to provide less detail and to reduce the computations needed in areas of less interest...An adaptive meshing change in orientation of a shared surface does not affect overall volume or the number of elements in the mesh. It allows a number of adjacent elements to improve their aspect ratio.").

Regarding claim 4, Marusich teaches a second condition of preventing the change of the shape of the target object formed of the cube data in paragraph 0039 lines 25-27 ("An adaptive meshing change in orientation of a shared surface does not affect overall volume or the number of elements in the mesh.").

Regarding claim 5, Marusich teaches a second condition of preserving the substantial shape of the target object formed of the cube data in paragraph 0039 lines 25-27 ("An adaptive meshing change in orientation of a shared surface does not affect overall volume or the number of elements in the mesh.").

Regarding claim 6, Marusich teaches a second condition of preventing the substantial volume of the cube elements in paragraph 0039 lines 25-27 ("An adaptive meshing change in orientation of a shared surface does not affect overall volume or the number of elements in the mesh.").

Regarding claim 7, Marusich teaches a second condition of combining the cube elements preserves the substantial volume of the cube elements, as described in paragraph 0039 lines 25-28 ("...smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger elements to provide less detail and to reduce the computations needed in areas of less interest...An adaptive meshing change in orientation of a shared surface does not affect overall volume or the number of elements in the mesh. It allows a number of adjacent elements to improve their aspect ratio.").

Regarding claim 8, Marusich teaches a second condition of maintaining the aspect ratio of each of the surfaces of each of the composite cube elements, as described in paragraph 0039 lines 25-28 ("...smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger elements to provide less detail and to reduce the computations needed in areas of less interest..."), is within a predetermined range, in which the total volume of the object is preserved, as described in paragraph 0039 lines 25-28 ("...An adaptive meshing change in orientation of a shared surface does not affect overall volume or the number of elements in the mesh. It allows a number of adjacent elements to improve their aspect ratio.").

Regarding claim 9, Marusich teaches that each of the composite elements that divide the surface has a rectangular parallelepiped shape in paragraph 0005 lines 1-7 ("The configuration of the elements used to divide the component or workpiece determines many of the properties and accuracy of the model...In three dimensions, tetrahedrons or cubes are often used."), where it is described that the mesh surface is divided into cube elements. Marusich also teaches that the aspect ratio of each of the surfaces of each of the composite cube elements is a ratio of a length of a first side to a length of a second side of the surfaces, the first and second surface sides being orthogonal to each other, as described in paragraph 0010 lines 6-9 ("Selected elements or regions of elements can be refined, or re-meshed with additional, smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio."), where it is described that the aspect ratio, which is known in the art to be the ratio between horizontal and vertical sides, and is therefore determined for the orthogonal sides of the elements of the surface.

Regarding claim 10, Marusich teaches that the grid lines portioning the cube elements are reduced in number as the cube elements are combined to be reduced in number in paragraph 0039 lines 25-28 ("...smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger elements to provide less detail and to reduce the computations needed in areas of less interest..."), where it is described that the mesh elements are formed into fewer, larger elements and the lines formed by rectangular mesh elements are therefore reduced as well.

Regarding claim 11, Marusich teaches a program embodied on a computer readable medium for causing a computer to execute a method of generating mesh data in paragraph 0042

lines 3-6 ("Embodiments of the invention will hereinafter be described in the general context of computer-executable program modules containing instructions executed by a personal computer (PC)."). Marusich teaches forming grid lines orthogonally crossing each other over a target in paragraph 0005 lines 1-7 ("The configuration of the elements used to divide the component or workpiece determines many of the properties and accuracy of the model...In three dimensions, tetrahedrons or cubes are often used."), where it is described that the mesh may be divided into cubes, which would provide orthogonally crossed lines over the surface of the object. Marusich also teaches forming cube data from mesh data obtained by dividing the target object by the grid lines, the cube data being formed of cube elements that are mesh elements forming the target object, wherein the cube data is obtained by determining whether each of mesh elements forming the mesh data forms the target object, as described in paragraph 0005 lines 1-7 ("The configuration of the elements used to divide the component or workpiece determines many of the properties and accuracy of the model...In three dimensions, tetrahedrons or cubes are often used.") and in paragraph 0039 lines 8-19 ("...elements can be refined, or re-meshed with additional, smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger elements to provide less detail and to reduce the computations needed in areas of less interest...Adaptive meshing further includes adding or removing elements in contrast to refining or coarsening the mesh."), where it is described that the mesh surface is divided. Marusich also teaches reducing the cube elements in number by combining the cube elements in paragraph 0039 lines 8-19 ("...elements can be refined, or re-meshed with additional, smaller elements to provide more detail, or to provide new elements with a non-

deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger elements to provide less detail and to reduce the computations needed in areas of less interest...Adaptive meshing further includes adding or removing elements in contrast to refining or coarsening the mesh."), in accordance with a predetermined condition selected from a group of predetermined conditions consisting of preventing a change of a shape of the target object formed of the cube data, preserving a substantial shape of the target object formed of the cube data, preventing a substantial change of a total volume of the combine cube elements, preserving the total volume of the combined cube elements, as described in paragraph 0039 lines 25-27 ("An adaptive meshing change in orientation of a shared surface does not affect overall volume or the number of elements in the mesh."), in which the predetermined condition is the preservation of the shape of the object, and maintaining an aspect ratio of surfaces of each of composite cube elements created by combining the cube elements within a predetermined range, as described in paragraph 0050 lines 8-11 ("The modeling element includes a good aspect ratio in the parent element and sub-elements to improve accuracy and computational efficiency."). It would have been obvious to one of ordinary skill in the art to modify the teachings of Marusich because the adaptive meshing that reduces the number of elements may be applied with any shape, including rectangles or cubes, comprising a mesh surface as known in the art.

Regarding claim 12, Marusich teaches a computer readable medium storing a program for causing a computer to execute a method of generating mesh data in paragraph 0044 lines 1-5 ("Program modules may be stored on the hard disk, magnetic disk 29, optical disk 31, ROM 24 and RAM 25. Program modules may include operating system 35, one or more application

programs 36, other program modules 37, and program data 38."). Marusich teaches forming grid lines orthogonally crossing each other over a target in paragraph 0005 lines 1-7 ("The configuration of the elements used to divide the component or workpiece determines many of the properties and accuracy of the model...In three dimensions, tetrahedrons or cubes are often used."), where it is described that the mesh may be divided into cubes, which would provide orthogonally crossed lines over the surface of the object. Marusich also teaches forming cube data from mesh data obtained by dividing the target object by the grid lines, the cube data being formed of cube elements that are mesh elements forming the target object, wherein the cube data is obtained by determining whether each of mesh elements forming the mesh data forms the target object, as described in paragraph 0005 lines 1-7 ("The configuration of the elements used to divide the component or workpiece determines many of the properties and accuracy of the model...In three dimensions, tetrahedrons or cubes are often used.") and in paragraph 0039 lines 8-19 ("...elements can be refined, or re-meshed with additional, smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger elements to provide less detail and to reduce the computations needed in areas of less interest...Adaptive meshing further includes adding or removing elements in contrast to refining or coarsening the mesh."), where it is described that the mesh surface is divided. Marusich also teaches reducing the cube elements in number by combining the cube elements in paragraph 0039 lines 8-19 ("...elements can be refined, or re-meshed with additional, smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger

elements to provide less detail and to reduce the computations needed in areas of less interest...Adaptive meshing further includes adding or removing elements in contrast to refining or coarsening the mesh."), in accordance with a predetermined condition selected from a group of predetermined conditions consisting of preventing a change of a shape of the target object formed of the cube data, preserving a substantial shape of the target object formed of the cube data, preventing a substantial change of a total volume of the combine cube elements, preserving the total volume of the combined cube elements, as described in paragraph 0039 lines 25-27 ("An adaptive meshing change in orientation of a shared surface does not affect overall volume or the number of elements in the mesh."), in which the predetermined condition is the preservation of the shape of the object, and maintaining an aspect ratio of surfaces of each of composite cube elements created by combining the cube elements within a predetermined range, as described in paragraph 0050 lines 8-11 ("The modeling element includes a good aspect ratio in the parent element and sub-elements to improve accuracy and computational efficiency."). It would have been obvious to one of ordinary skill in the art to modify the teachings of Marusich because the adaptive meshing that reduces the number of elements may be applied with any shape, including rectangles or cubes, comprising a mesh surface as known in the art.

Regarding claim 13, Marusich teaches an apparatus for generating mesh data in paragraph 0042 lines 3-6 ("Embodiments of the invention will hereinafter be described in the general context of computer-executable program modules containing instructions executed by a personal computer (PC)."). Marusich teaches forming grid lines orthogonally crossing each other over a target object in paragraph 0005 lines 1-7 ("The configuration of the elements used to divide the component or workpiece determines many of the properties and accuracy of the

model...In three dimensions, tetrahedrons or cubes are often used."), where it is described that the mesh may be divided into cubes, which would provide orthogonally crossed lines over the surface of the object, therefore the computer system contains a setting part for performing the grid line formation. Marusich also teaches forming cube data from mesh data obtained by dividing the target object by the grid lines, the cube data being formed of cube elements that are mesh elements forming the target object, wherein the cube data is obtained by determining whether each of mesh elements forming the mesh data forms the target object, as described in paragraph 0005 lines 1-7 ("The configuration of the elements used to divide the component or workpiece determines many of the properties and accuracy of the model...In three dimensions, tetrahedrons or cubes are often used.") based on a first condition of the target object in the mesh element, as described in paragraph 0039 lines 8-19 ("...elements can be refined, or re-meshed with additional, smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger elements to provide less detail and to reduce the computations needed in areas of less interest...Adaptive meshing further includes adding or removing elements in contrast to refining or coarsening the mesh."), therefore the computer system contains a calculation part for obtaining the cube data. Marusich also teaches reducing the cube elements in number by combining the cube elements in paragraph 0039 lines 8-19 ("...elements can be refined, or re-meshed with additional, smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger elements to provide less detail and to reduce the computations needed in areas of less interest...Adaptive meshing further includes

adding or removing elements in contrast to refining or coarsening the mesh."), in accordance with a predetermined condition selected from a group of predetermined conditions consisting of preventing a change of a shape of the target object formed of the cube data, preserving a substantial shape of the target object formed of the cube data, preventing a substantial change of a total volume of the combine cube elements, preserving the total volume of the combined cube elements, as described in paragraph 0039 lines 25-27 ("An adaptive meshing change in orientation of a shared surface does not affect overall volume or the number of elements in the mesh."), in which the predetermined condition is the preservation of the shape of the object, and maintaining an aspect ratio of surfaces of each of composite cube elements created by combining the cube elements within a predetermined range, as described in paragraph 0050 lines 8-11 ("The modeling element includes a good aspect ratio in the parent element and sub-elements to improve accuracy and computational efficiency."), therefore the computer system contains a combining part for performing the combining of the elements into fewer, larger elements. It would have been obvious to one of ordinary skill in the art to modify the teachings of Marusich because the adaptive meshing that reduces the number of elements may be applied with any shape, including rectangles or cubes, comprising a mesh surface as known in the art.

Regarding claim 14, Marusich teaches dividing a target object in to a plurality of first elements using an orthogonal grid, each element corresponding to first data, which is the target object in paragraph 0005 lines 1-7 ("The configuration of the elements used to divide the component or workpiece determines many of the properties and accuracy of the model...In three dimensions, tetrahedrons or cubes are often used."), where it is described that the mesh surface is divided into cubes and that therefore contains orthogonal lines that form a grid over the surface.

Marusich also teaches combining the plurality of first elements according to a predetermined condition, in which the shape of the object is preserved as described in paragraph 0039 lines 25-27 ("An adaptive meshing change in orientation of a shared surface does not affect overall volume or the number of elements in the mesh."), to generate a plurality of second elements, each second element corresponding to second data, wherein a number of second elements is smaller that a number of the first elements, ad described in paragraph 0039 lines 8-19 ("...elements can be refined, or re-meshed with additional, smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger elements to provide less detail and to reduce the computations needed in areas of less interest").

Regarding claim 15, Marusich teaches dividing a target object in to a plurality of first elements using an orthogonal grid, each element corresponding to first data, which is the target object in paragraph 0005 lines 1-7 ("The configuration of the elements used to divide the component or workpiece determines many of the properties and accuracy of the model...In three dimensions, tetrahedrons or cubes are often used."), where it is described that the mesh surface is divided into cubes and that therefore contains orthogonal lines that form a grid of cube data over the surface. Marusich also teaches reducing the cube elements in number by combining the cube elements, in paragraph 0039 lines 8-19 ("...elements can be refined, or re-meshed with additional, smaller elements to provide more detail, or to provide new elements with a non-deformed aspect ratio. Alternatively, selected elements or regions of elements can be re-meshed or coarsened with fewer, larger elements to provide less detail and to reduce the computations needed in areas of less interest"), in accordance with a predetermined condition, in which the

shape of the object is preserved, as described in paragraph 0039 lines 25-27 ("An adaptive meshing change in orientation of a shared surface does not affect overall volume or the number of elements in the mesh.").

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Said Broome whose telephone number is (571)272-2931. The examiner can normally be reached on 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571)272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

S. Broome
7/7/06 SB

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